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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/506,769	04/19/2005	Marco Romagnoli	05788.0318	3559
22852 7590 04/24/2007 FINNEGAN, HENDERSON, FARABOW, GARRETT & DUNNER LLP 901 NEW YORK AVENUE, NW WASHINGTON, DC 20001-4413			EXAMINER WONG, TINA MEI SENG	
			ART UNIT	PAPER NUMBER
			2874	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		04/24/2007	PAPER	

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/506,769	ROMAGNOLI ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Tina M. Wong	2874	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 19 March 2007.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 15-36 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 15, 17-20, 26, 27, 29, 30, 32, 35 and 36 is/are rejected.
- 7) ☒ Claim(s) 21-25, 28, 33 and 34 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 19 March 2007 has been entered.

### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 15, 17-20, 29, 30 and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication 2003/0123827 to Salerno et al.**

In regards to claim 15, Salerno et al discloses a device for crossing optical beams comprising at least a first input optical waveguide (1356) directed along a first axis and a second optical waveguide directed along a second axis including with respect to the first axis, an optical crossing region at the intersection of the first and second axis (Figure 42A) and a photonic crystal (1354) having a regular non-zero periodicity in the optical crossing region.

In regards to claim 17, Salerno et al shows the first and second axis having the same direction as the first and second crystal axis, respectively.

In regards to claim 18, Salerno et al shows the first and second axis to be perpendicular to each other.

In regards to claim 19, Salerno et al discloses the photonic crystals to extend in a square or rectangular portion of an optical integrated structure and wherein the first and second optical input waveguides are coupled to the respective edges of the portion.

In regards to claim 20, Salerno et al shows the photonic crystal to have a period array of holes arranged according to a square geometry.

In regards to claim 29, Salerno et al discloses a method for crossing optical beams including the steps of providing a photonic crystal (1354) comprising a dielectric material and a periodic array of regions realized in the dielectric material, the regions of the periodic array having a refractive index different from the refractive index of the dielectric material, the photonic crystal having a regular non-zero periodicity and having at least a first and a second crystal axes; and feeding to the photonic crystal a first and a second optical beam along a first and a second direction corresponding to the crystal axes, so that the first and second optical beams cross each other in the optical crystal, wherein the first and second optical beams have respective wavelengths suitable for photon guiding into the photonic crystal.

In regards to claim 30, Salerno et al discloses feeding to the photonic crystal a first and a second optical beam comprises guiding the first and second optical beams into a first and a second input waveguide directed along the first and a second crystal axes, respectively.

In regards to claim 32, Salerno et al shows the periodic array of regions having a square geometry.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 16 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2003/0123827 to Salerno et al as applied to claims 15 and 29 above.**

In regards to claims 16 and 31, although Salerno et al does not explicitly state the waveguides to have input and output sections, it is clearly shown in the figures for the device to have a first and second output optical waveguide opposite of the first and second input optical waveguide with respect to the crossing region and directed along the first and second axis. Although the first and second inputs are not opposite of the first and second outputs respectively, one could reasonably adjust the input and output ports of the device in order to meet the output requirements of the device. Therefore, it would have been obvious at the time the invention was made to a person having ordinary skill in the art for the first and second inputs to be opposite of the first and second outputs respectively in order to meet any output connections required.

**Claims 26 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2003/0123827 to Salerno et al as applied to claim 15 above.**

In regards to claim 26, although Salerno et al does not specifically disclose the first and second input waveguides are integrated waveguides, however, it can be observed from the

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figures that the waveguides are integrated into the photonic slab. Therefore, although not explicitly stated, Salerno et al does show the first and second input waveguides to be integrated waveguides.

In regards to claim 27, Salerno et al discloses all discussed above, but fails to specifically disclose the first and second input optical waveguides to be optical fibers. However, in order for the defect section carrying the signal to be transmitted and not lost, an optical component capable of carrying an optical signal must be coupled to the defect waveguide section. Furthermore, a waveguide is just a more general term for an optical fiber (i.e. an optical fiber is a type of waveguide) Therefore, although not explicitly stated, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have included an optical fiber as the first and second input optical waveguides in order to transmit and receive a signal.

**Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6, 198,860 to Johnson et al as applied to claim 29 above.**

In regards to claims 35 and 36, although Salerno et al does not specifically disclose the first and second optical beams to have the same wavelength or different wavelengths, Applicant has claimed that either the same or different wavelength would be suitable for guiding into the photonic crystal. Since Applicant has not disclosed either the same or different wavelength to solve any stated problem or is for any particular purpose and Applicant has claimed that either the same or different wavelength would be suitable for guiding into the photonic crystal, it would have been obvious at the time the invention was made to a person having ordinary skill in the art to have the first and second optical beams to have the same wavelength or different wavelengths.

***Allowable Subject Matter***

**Claims 21-25, 28, 33 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.**

In regards to claims 21-25, the prior art of record fails to disclose or reasonably suggest all of the limitations of the base claim (claim 15) and any intervening claims (none), but more specifically, the prior art fails to disclose or reasonably suggest the first and second axis directions to be defined by an angle of  $\Pi/3$  which is  $60^\circ$ . All of the prior art cited by the Examiner, relied upon by the Examiner and submitted by Applicant only suggest a rectangular/square photonic lattice configuration showing a perpendicular direction of the two axis directions. See U.S. Patent 6,684,008 to Young et al, Figure 5 as another example of a perpendicular axis direction.

In regards to claim 28, the prior art of record fails to disclose or reasonably suggest all of the limitations of the base claim (claim 15) and any intervening claims (none), but more specifically fails to disclose or reasonably suggest the dimensions of the regions and periods of the array are related so that starting from an isotropic distribution of the wave vectors of the electromagnetic radiation within a first angular range that is twice the angular extension of the first irreducible Brillouin zone of the photonic crystal and the group velocity vectors corresponding to said wave vectors are rearranged during propagation in said photonic crystal that at least 50% of the group velocity vectors are directed within a second angular range that is about one-third of said first angular range and the width at half- maximum of the distribution of

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the modules of the velocity group vectors is lower than about two-thirds of said second angular range.

In regards to claims 33 and 34, the prior art of record fails to disclose or reasonably suggest all of the limitations of the base claim (claim 29) and any intervening claims (none), but more specifically fails to disclose or reasonably suggest the photonic crystal having a third crystal axis and the method further comprises feeding to the photonic crystal a third optical beam along a third direction corresponding to the third axis, so that the third optical beam crosses the first and second optical beams in the optical crystal, the third optical beam having a wavelength suitable for photon guiding into the photonic crystal. Although Johnson et al does disclose a three dimensional photonic crystal, Johnson et al only teaches two optical waveguides and not three optical waveguides with a third axis to cross with the first and second waveguides.

### ***Response to Arguments***

Applicant's arguments with respect to claims 15-20, 26, 27, 29, 30, 32, 35 and 36 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tina M. Wong whose telephone number is (571) 272-2352. The examiner can normally be reached on Monday-Friday 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571) 272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
Tina M Wong  
Patent Examiner  
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